









May 11.2017 Jim Neumann Honeywell Aerospace Engines & Power Systems Overview

2017 AIMS CENTER OPEN HOUSE



Defense & Space Products & Services Span ~300 Platforms



Fighter/Attack/
Trainer Aircraft

30
PLATFORMS



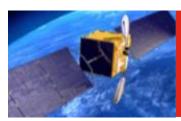
Human Space 10 + PLATFORMS



Surface/ Soldier Vehicles
15 +
PLATFORMS



Bomber Aircraft
3
PLATFORMS



DoD, Civil, and Commercial Space

30 +
PLATFORMS



Military
Helicopters
20 +
PLATFORMS



Mobility/Tanker Aircraft 40 + PLATFORMS



Missiles and Munitions 80 + PLATFORMS



Naval
Platforms
10 +
PLATFORMS



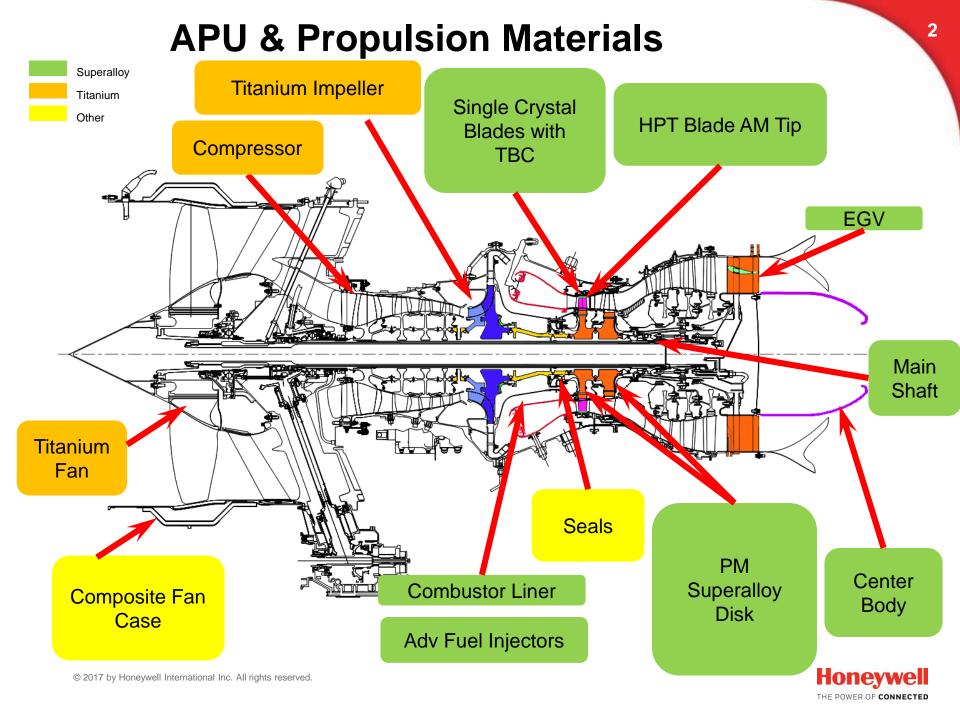
Special Mission/ UAV Aircraft 20 + PLATFORMS



International 20 + PLATFORMS



Commercial Helicopters
20 +
PLATFORMS



Honeywell's Interaction with Academia

CANFSA -Center for advanced non-ferrous structural alloys

Model:







Colorado School of Mines (CSM) -





- Fodus is on developing advanced non-ferrous structural alloys
 - Three main trust areas
 - · Lightweight non-ferrous alloys (Ti, Al, Mg)
 - High performance non-ferrous alloys (Ti, Ni, CMCs, new alloy concepts)
 - · Advanced alloys and processes (AM, RSP, coatings)
 - Pre competitive materials and process development

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Thermo-Calc Software

BOEING













GE Aviation

Honeywell

Objectives:

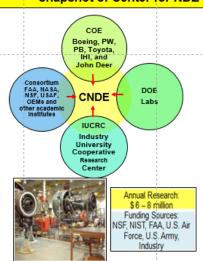


- Become the premier place for research in the area of hon-ferrous structural alloys
- Bring together university and industry researchers
 - Conduct basic and applied physical metallurgy research on non-ferrous structural allovs
- Combine computational modeling, processing, and state-of-the-art characterization methods
 - · Address projects of interest to industrial members
- Train students
 - Become critical players in industries that develop or use non-ferrous alloys

W WEBER METALS, INC.

Industry/University Cooperative Research Center (I/UCRC) at Center for NDE (CNDE) at *ISU Cont'd

Snapshot of Center for NDE (CNDE) at *lowa State University (ISU)



- Established 1985 for research collaborations with OEMs, with Honeywell (then Allied Signal) as founding member. Industry Liaison - Dr. Surendra Singh-
- Annual membership \$35k /vr with more than 25 members from aerospace, manufacturing and government agencies including FAA, DOE, Air
- Only center in North and South America with close to 50 researchers and scientists.
- Unlimited access to reports, students, faculties, research meetings and conferences.
- New hire and recruits and continuing education and training (Nathan Miller from DOE's National Security Campus, managed by Honeywell FM&T. pursuing his Ph.D. program. Hired new NDE staff this year.
- Sensors development and applications, NDE models and simulations, Model Assisted POD, Advanced NDE technology including Terahertz, Laser Ultrasound, Phased Array UT, and CT

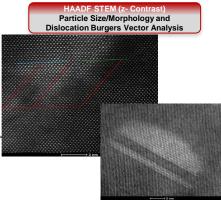
Snapshot of Center for NDE that manages and houses IUCRC

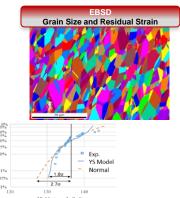


AIMS Center Thrust Potential Alignment with

Honeywell









Multiscale modeling from nano to

structural scale

Physics based high fidelity multiphysics models of materials using molecular dynamics and continuum mechanics

Composite, metallic, & superalloy materials

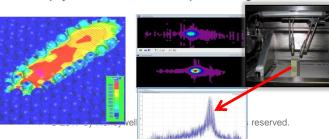
Complete multiscale characterization and testing of various material systems using novel state of the art equipment

System health management & prognosis

Foundation of structural health monitoring covering sensor development, sensor placement, data fusion, mining & informatics

Intelligent design & multidisciplinary optimization

Combining advanced optimization algorithms with validated physics based models for optimal design



Multifunctional materials & adaptive systems

Novel smart material development for future multifunctional and multipurpose needs

Bioinspired materials and robotics

Low energy high efficiency materials and robotic structures designed for extreme environments



Honeywell

THE POWER OF CONNECTED



CANFSA -Center for advanced non-ferrous structural alloys

Model:

- Part of NSF sponsored research centers
 - Universities participating



- Colorado School of Mines (CSM) -Lead
- Iowa State University (ISU)
- Focus is on developing advanced non-ferrous structural alloys
 - Three main trust areas
 - Lightweight non-ferrous alloys (Ti, Al, Mg)
 - High performance non-ferrous alloys (Ti, Ni, CMCs, new alloy concepts)
 - Advanced alloys and processes (AM, RSP, coatings)
 - Pre competitive materials and process development

 Los Alamos
- Current members



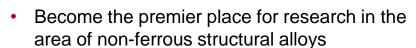












Theory & Modeling

Performance

- Bring together university and industry researchers
 - Conduct basic and applied physical metallurgy research on non-ferrous structural alloys
- Combine computational modeling, processing, and state-of-the-art characterization methods
 - Address projects of interest to industrial members
- Train students
 - Become critical players in industries that develop or use non-ferrous alloys









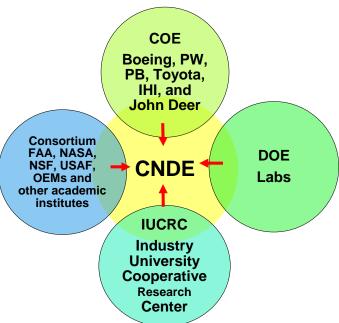






Industry/University Cooperative Research Center (I/UCRC) at Center for NDE (CNDE) at *ISU Cont'd

Snapshot of Center for NDE (CNDE) at *lowa State University (ISU)





Annual Research: \$6 – 8 million Funding Sources: NSF, NIST, FAA, U.S. Air Force, U.S. Army, Industry

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- Annual membership \$35k /yr with more than 25 members from aerospace, manufacturing and government agencies including FAA, DOE, Air Force.
- Only center in North and South America with close to 50 researchers and scientists.
- Unlimited access to reports, students, faculties, research meetings and conferences.
- New hire and recruits and continuing education and training (Nathan Miller from DOE's National Security Campus, managed by Honeywell FM&T, pursuing his Ph.D. program. Hired new NDE staff this year.
- Sensors development and applications, NDE models and simulations, Model Assisted POD, Advanced NDE technology including Terahertz, Laser Ultrasound, Phased Array UT, and CT

Business Overview

\$39.3B in sales for 2016

HQ: Morris Plains, NJ

Fortune 100

NYSE: HON

~70 countries

~1,300 sites

Aerospace

HQ: Phoenix, AZ and Rolle, Switzerland \$14.8B Sales



Unmatched Offerings

- and Software Aircraft Solutions
- Apps, Services, Maintenance, Subscriptions
- Electronic, Mechanical · Connectivity Solutions From Hardware to **Airtime**
 - Turbochargers for Fuel Efficiency

Performance Materials and Technologies

HQ: Morris Plains, NJ \$9.3B Sales



Winning Technology

- Refining and Petrochemical Catalysts
- Gas Processing Modular Offerings
- Solstice® LGWP Materials
- SmartLine **Transmitters**
- Asset Optimization Software

Home and Building Technologies

HQ: Minneapolis, MN **\$10.7B Sales**



Connecting Homes and Buildings

- Security and Fire
- Connecting Homes With Lyric
- Open Software Connecting "Internet Of Things" in Buildings

Safety and Productivity **Solutions**

HQ: Minneapolis, MN \$4.6B Sales



Connecting Workers

- Wireless, Voice, Mobility, Data Analytic Solutions for Workers
- Warehouse Automation
- Keeping Workers Safe

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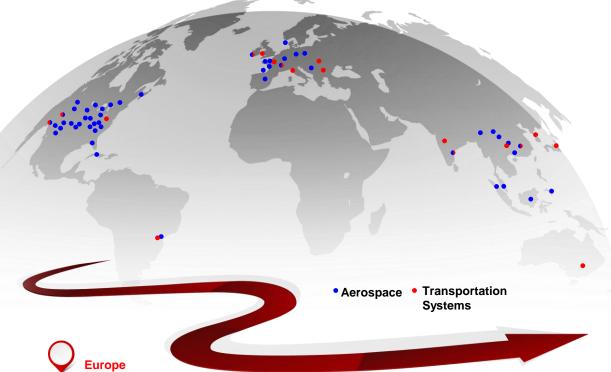
Aerospace Global Footprint



Anniston, AL Glendale, AZ Kingman, AZ Phoenix, AZ - 34th Street - Deer Valley - Sky Harbor Tempe, AZ Tucson, AZ Poway, CA Torrance, CA Norcross, GA Savannah, GA Clearwater, FL Sarasota, FL South Bend, IN Olathe, KS Wichita, KS Albuquerque, NM Prince Edward Island Columbia, MD Plymouth, MI Coon Rapids, MN Golden Valley, MN

Minneapolis, MN
Plymouth, MN
Kansas City, MO
Rocky Mount, NC
Morristown, NJ
Green Island, NY
Tulsa, OK
Urbana, OH
Allentown, PA
Greer, SC
Memphis, TN
Houston, TX
Everett, WA
Redmond, WA
Renton, WA

Chihuahua, Mexico Mexicali, Mexico Monterrey, Mexico Toronto, Ontario Ottawa, Ontario Aguadilla, Puerto Rico



Sofia, Bulgaria hagen, Denmark

Copenhagen, Denmark
Waterford, Ireland
Maintal, Germany
Raunheim, Germany
Atessa, Italy
Vendome, France
Toulouse, France
Paris, France
Thaon-les-Vosges, France
Olomouc, Czech Republic
Brno-Slatina, Czech Republic
Prague, Czech Republic

Bucharest, Romania

Rolle, Switzerland
Presov, Slovakia
Cheadle, UK
Aylesbury, UK
Basingstoke, UK
Bournemouth, UK
Edinburgh, UK
Feltham, UK
Hemel Hempstead, UK

Redditch, UK Tewkesbury, UK Whitstable, UK

Yeovil, UK



Asia & Australia

Ballarat, Australia
Bintan, Indonesia
Wuhan, China
Xiamen, China
Xi'an, China
Changsha, China
Nanjing, China
Suzhou, China
Shanghai, China
- Li Bing Road
- Jing Lian Road

Pune, India

Bangalore, India Kodama, Japan Penang, Malaysia Subic Bay, Philippines Singapore – Gul Circle – Chai Chee – Changi Bus Park – Joo Koon Circle – Loyang Crescent

Ansan, South Korea



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South America

Guarulhos, Brazil

Sao Jose dos Campos, Brazil

Aerospace Profile



Headquartered in Phoenix, Arizona, USA and Rolle, Switzerland

2

35,000 Employees ~80 Global manufacturing and service sites





Innovates and integrates thousands of products and services to advance and easily deliver safe, efficient, productive and comfortable experiences worldwide.



An airliner with Honeywell Wheels & Brakes lands somewhere in the world every 5 seconds.

Presence in Arizona

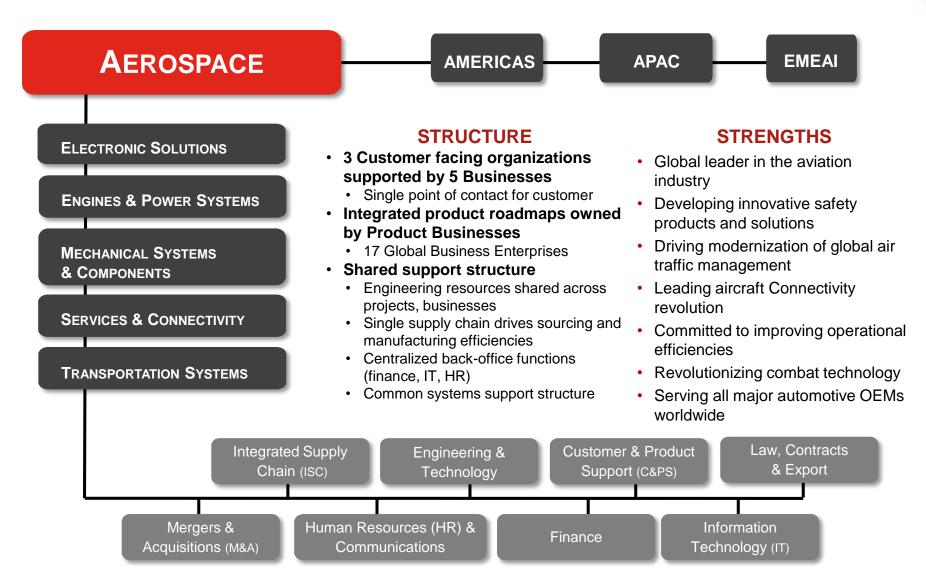
- We employ ~5,965 Arizonans, with over a billion-dollar payroll in the state.
- Arizona is home to 11 facilities supporting research and development, engineering, manufacturing, test laboratories, sales, marketing, customer service, and more.
- We invest ~\$790 million/year with Arizona-based suppliers.



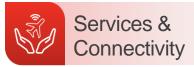
- Thousands of Honeywell Aerospace technologies, products and services are found on virtually every commercial, defense and space aircraft worldwide.
- Through Honeywell Hometown Solutions, we partner with leading public and non-profit institutions to connect in powerful ways to address needs in the communities where we live and work.
- In 2016, Honeywell donated over \$1 million and >5,000 volunteer hours to schools, communities and non-profits.
- In support of math and science, Honeywell has multi-year relationships with the Arizona Technology Council, AZ SciTech Festival and the Fiesta Bowl Aerospace Challenge.
- Each year, we sponsor numerous Arizona students and middle school teachers to attend the Honeywell Leadership Challenge Academy and Honeywell Educators @ Space Academy at the US Space and Rocke Center.
- In partnership with Rebuilding Together, several Arizona projects are conducted annually.



Business Overview



A Robust Portfolio of Solutions



- Deliver improved efficiency and productivity for flight crews and maintainers, increased availability and profitability for owners / operators, and a more productive, enjoyable and safe travel experience for flight crews and passengers
- Enabling equipment such as satellite communication servers, cabin management, and information management systems
- Flight support (including cockpit), cabin, and maintenance apps and services
- Connectivity services
- GoDirect network and portal infrastructure (ground network, business operations)
- Proactive support
- Connected projects



- Integrated avionics offerings
- · Navigation, safety and surveillance solutions
- Flight management systems, flight controls and synthetic vision display technologies
- Manned, unmanned and satellite applications for space



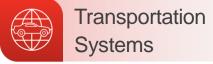


Engines & Power Systems

- Propulsion engines
- Auxiliary power units
- Electric power systems



- Air & Thermal Management
- Electromechanical Products & Systems
- · Wheels & Braking Systems
- Actuation, Fuel & Pneumatic Components
- Federal Manufacturing & Technologies (FM&T)



- Light vehicle diesel and gasoline turbochargers
- On- and off-highway commercial vehiclesturbochargers
- · Automotive software solutions
- Electric boosting
- Aftermarket

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